CASSINI STAR TRACKING AND IDENTIFICATION ARCHITECTURE

E. W. Dennison[1], J, W. Alexander[1], G. Borghi[2], D. Procopio[2], and V. Thomas[1]

The Cassini spacecraft will launch October 1997 and will perform a detailed examination of the Saturnian system, including the release of a probe to study Saturn's largest satellite, Titan. The star tracker for the Cassini mission must provide accurate data during the 12 years of flight including four years of measurement in a harsh radiation environment, The star tracker will provide autonomous star identification over the entire celestial sphere using a 4,000 entry on-board star catalog, Three axis attitude reference will be determined by measurements of two stars in the tracker field of view and this will allow the gyroscopes to be turned off during the cruise phase of the flight.

An overview of the Cassini Star Tracker hardware, requirements and algorithms is presented, The Cassini Star Tracker consists of a CCD based star camera, called the Stellar Reference Unit (SRU), which is being built by Officine Galileo(2).   The operation of the SRU, including functional modes, exposure times, and areas of the CCD to digitize is under the control of the Cassini Attitude and Articulation Control Subsystem (AACS) Flight Computer (AFC). The raw digital pixel data is transmitted from the SRU through a dedicated direct memory access (DMA) interface to the AFC memory for subsequent processing. All pixel processing and centroiding is performed within the AFC.

Once the initial attitude has been determined, the AFC algorithms will choose which stars within the SRU field of view to track in order to maintain attitude knowledge. The SRU will have a 15° field of view and will provide $60\,\mu$rad (3σ) 2-axis position measurement accuracy for stars of approximate] y 6.2 visual magnitude and brighter. The required 1 mrad (3σ) twist accuracy is provided by star separation.

The SRU will be one of the spacecraft attitude reference sensors that arc integrated into the three axis attitude determination system,

'Jet Propulsion Laboratory, California Institute of I'ethnology, Pasadena, CA.

[2]Officine Galileo, Florence, Italy.

1) **Scc** Page One

2) **Sec** Page One

3) [1]   Jet Propulsion Laboratory, California institute of Technology
Mail Stop: 198-235
Pasadena, CA 91109-8099
U. S, A.
Dennnison: (818)354-6074
Alexander: (818) 354-202.0
Thomas: (818)354-5429
Fax: (818)393-6478

[2]   Officine Galileo
Via A, Einstein 35
50013 Campi Bisenzio (Florence)
Italy
Borghi: 39-55-895-0218
Procopio: 39-55-895-01
Fax: 39-55-895-0613

4) Submitted to: Space Guidance, Control, and Tracking. (5-8 April 1994). Conference Chair: Morris M. Birnbaum.

5) Oral Presentation

6) Abstract Text

7) Edwin Dennison
Swarthmore College B.A. (1949)
University of Michigan Ph. D. (1954)
Sacramento Peak Observatory, Sunspot New Mexico (19S4- 1963)
Mt. Wilson and Palomar Observatories, Pasadena California (1963-1976)
Science Applications Incorporated, La Jolla, California (1976-1969)
Jet Propulsion Laboratory, Pasadena, California (1969-)

Dr. Dennison has had a professional career specialty in photometric and astronomical electronic systems,   He has been working with CCD star trackers since 1969. As a member of the JPL Optical Tracking group he has worked on the ASTROS tracker as a member of the development team and the ASTRO-1 ground support team (Dec. 1990). Since 1986 he has supported the development of new tracker hardware for the Cassini mission,